International Journal of Application or Innovation in Engineering & Management (IJAIEM)
Web Site: www.ijaiem.org Email: editor@ijaiem.org
Volume 9, Issue 4, April 2020 **ISSN 2319 - 4847**

Critical Barriers to apply quality performance management in construction projects

Mohamed Mohamed Abdelkarim [1], Ibrahim Mahdi [2], Ibrahim AbdelRashid [3]

[1]Civil Engineering, Ain shams university Cairo, Egypt

[2] Projects management, Future University, Cairo, Egypt

[3]Civil Engineering, Ain shams University, Cairo, Egypt

Abstract: ***The historical Successes of quality performance management implementation in manufacturing industry were encouraged the construction companies to apply it in managing their projects' performance to improve the rate of productivity, reducing cost of poor quality and increasing customer satisfaction but the complexity and uncertainty in the construction industry are acted as main challenge points for quality performance management implementation in construction projects. This resulted in pushing a lot of researchers to conduct a lot of significant studies to identify barriers to apply quality performance management in construction projects. Most of the studies are focused more on identifying the barriers rather than determine the critical barriers. This research was conducted to collect and classify the barriers according to each project phase (Plan, Do, Check and Act), rankthe identified barriers by assessing and combining their probability of occurrence and impact using qualitative risk analysis, identify the major / critical barriers that account for most of the problem using Pareto tool. Therefore project team members can prioritize their remedial strategy to overcome these barriers towards sustainable implementation quality performance management system.***
Main finding:22 barriers were identified and ranked, 60% improvement in applying quality performance management can be achieved by mitigate the effect of first 11 barriers
Key Words: Quality performance management system (QPMS), Quality performance management system frame work (QPMSF), Impact and probability number (S x O)

Introduction

(Hoonakker 2010;Polat et al. 2011; Osmania and Ramolli 2012; Jamadagni and Birajdar 2015; Shinde and Hedaoo 2017) Starting from the manufacturing industry third revolution and till now the quality performance management has a significance role in improving the operation's performance in manufacturing industrythroughout setting some of the activities starting by identifying a specific, measurable, achievable, realistic and time able objectives (smart objectives), skills required, results need to be obtained for achieving these objectives and the ways / actions to achieve them , quantifying the actions with identifying areas of improvement. This resulted, in encouraging the construction companies to improve their operation performance throughout control the deviation between the planned and achieved objectives using quality performance management system but the difficulties in construction industry such as (tight project cost and schedule, lack of resources, changing of demands) were developed different barriers lead to decrease the role of quality performance management system in enhancing the construction project's performance as said by Changali et al. (2015) that "the productivity per worker ($ thousands) in the manufacturing is nearly doubled in the construction through the last 20 years ". The big difference in improving the rate of productivity between the construction and manufacturing industry, this resulted in pushing a lot of researchers to identify the different barriers and their effect on the role of QPMS. In the last 2 decades, a lot of barriers were identified such as (More paperwork, increase project cost, need a lot of training, difficulty of measuring, less flexibility in operation, etc.), this resulted in increasing people's resistanceto the QPMS implementation and misconception to benefits of applying QPMS in construction projects.

Problem statement and objective:

Construction projects are always characterized by tight schedule and resource limitation, this resulted in the difficulty of applying remedial actions for all of the QPMS implementation barriers sothis research will be conducted to collect and classify the barriers according to each project phase (Plan, Do, Check and Act), rank the identified barriers and identify the major / critical barriers which are limited the role of quality performance management system in enhancing

the project's performance and are account for most of the problem, therefore project's team members canfocus their effort to adapt their management practice in overcomingmajor / critical barriers during the project life phases Plan, Do, Check and Act

Research Methodology:

(Adedokun et al 2013; Defoe and Juran 2016) Qualitative risk analysiscan be used as a tool for analyzing the collected data to prioritize the issues by assessing and combining the probability of occurrence (O) and impact (S)using a relative scalefor identifying the most serious issues using Pareto rule (the major causes of the problem which are account (60~80) % of the total problem incurred). In this research, literature review will be carried out to collect data relevant to the barriers of QPMS implementation in construction projects. Asemi structuredinterviews will be conducted with short experts list have sufficient work experience in the construction industry to verify the collected data and classify the barriers according to project's phases The verified list of barriers will be prepared and sent with interview request for different construction professionals to rate the impact of each barrier(S) and the probability of causes' occurrence (O) using rate scale (very low = 1, low = 2, Medium = 3, High = 4, very High= 5). The final rating will be calculated using

$\Sigma\, WiXi \,/\, \Sigma\, Xi$

Wi = weight given to the ith response (1, 2, 3, 4, 5)
Xi = frequency of the ith response

The barriers will be ranked in descending order according to their (S x O) number and send again to same construction professionalsto verify the final barriers' ranking list.The obtained accumulative percentage of (S x O) number will be used to identify the major barriers which are account (60~80) % of the total problem incurred so the project team can focus their effort on major barriers to mitigate / eliminate their impact towards sustainable implementation QPMS.

Data collection

A compressive literature review was carried out for significant number of studies had been conducted in maintopics related to this research, Barriers to apply QPMS in construction project

- Keng (2010) Poor understanding for the relation between quality, cost and time have always negative effect on top management commitment to the quality management system's implementation and they (top management) always place the priority for the Cost and time against quality due to project's tight budget and time schedule.
- Hoonakkera et al. (2010) main barriers to quality can be summarized in lack of skilled workers and supervision, delay and shortage in resources' allocation and a lot of change due to working with new people and unrealistic deadlines.
- Keng et al. (2011) Problems Paper works, increase in time, unacceptance of project staff to the quality system, inadequate technical expertise / skills, increase Cost, ineffective communication, difficulties in measuring results, lack of understanding to the quality system and need for management support are acting s main barriers start to apply quality management system
- Femi (2015) Identified different barriers of practicing total quality management in Nigerian construction industry Which can be summarized as following lack of workforce qualified in quality management implementation, difficulties in mapping processes and developing standard procedures, quality measures and quality information system, lack of monitoring and measuring activities including quantifying cost of poor quality, increases in paper work, need for conducting continuous training programs for employee, Too tight schedules, ineffective Communication system.
- Ingason (2015)Missing management support and participation of employees in the process with a clear relevant objective setting are acted as main factors for unsuccessful implementation of ISO 9001 in managing the performance.
- Jelinkova and Striteska (2015) Performance measurement process is a core of managing performance by proper identifying for the key factors which have an effect on the work's performance and decision-making process. This process is need employees with high skills to consistently review and modify the performance measurement system to represent the actual performance and develop it according to company's management system capability and any update in planned targets.
- Callistus and Clinton (2016) Ten (10) barriers were ranked in descending order according to their level of impact on the implementation of project monitoring and evaluation activities as following weakness of the organization capacity, limited resources and budgetary allocations , weakness of link between planning, budgeting and monitoring and evaluation activities, low demands for the monitoring and evaluation results, poor data of quality, incompliance with planning and monitoring and evaluation guidelines ,the incapable

processes for meeting its objectives, missing for database system , development a poor quality objectives can't be used for evaluate the project performance and not consistent with the needs and values of intended beneficiaries.

- Hristov and Chirico (2016) there is a limitation for using balance score card framework for managing the Performance because it fails to account for the role of "motivated employees" as a critical issue for managing the Performance.
- Lodgaarda et al. (2016). The disappointment and failure for applying the continuous improvement can be due to human factors and or Continuous improvement is not emerge behavioral patterns in the workplace.
- Keng and Kamal (2016) Two main categories are acted as main causes to apply QPMS in construction projects, the first one is human-related problems which is included lack of top management and employees' commitment, lack of training for management and employees and resistance to change and the second one is technical-related problems which is included high implementation cost, lack of resources, difficult to interpret the standard and requirement of quality system, increased in paperwork. They built their research results on studying have been done last 20 years about the problems encountered from implementing quality management and can be summarized as following top management don't place quality as the priority against the factor of time and cost which represent the misconception in understanding the concept and philosophies behind the ISO standards, not comparing cost of good quality to the cost of poor quality, generation of a huge amount of paperwork; lack of understanding for the employees to the management system requirements and the objectives of the applying,insufficient time establish / develop effective QPMS before start work execution, effective implementing for the quality management system can't be achieved unless proper communications lines have to be provided with availability of resources.
- (Keng and Kamal 2016; ISO 9001) Poor applying for PMSF process (identify the objective, operating processes and the sequence and interaction of these processes and monitoring, measurements and related performance indicators) is lead to poor quality performance management system which is lead to uneconomic (inefficiency), Bureaucratic, high paper generating, fail to recognize or comprehend the fundamental requirements of quality management and fail for tracking the cost of poor quality.

Data Analysis

All pervious data were gathered and summarized in preliminary list and verified by 10 construction professionals. Their expertise more than 15 years within construction industry in different construction disciplines during semi structured interview (4 quality managers, 2 project manager, 2 project controls and 2 construction manager), this resulted in preparing (table 01) has 22identified barriers which are existing during different project phases (Plan, Do, Check and Act)

Table 01 Identified Barriers to apply QPMS

PLAN	DO	CHECK	ACT
Tight Project Budget Tight Project schedule Misconception to the QPMS benefits / objectives Lack of top & middle management support & commitment to the Of demand for and utilization of the QPMS Insufficient time to collect the required information Turnover / lack of resource allocation Lack / Changes in assign the responsibilities , roles , work procedure and Objectives Poor / Ineffective Communication Lack of required qualitative and quantitative data during QPMS planning Difficulty in applying QPMSF including identify and develop the operations objective, critical success factors / critical to quality , operation processes and mapping the interaction between them, standardized procedures with the inputs required and the expected outputs, quality measures , continuously monitoring and controlling process Poor designed QMS	Need Huge amount and complex of paperwork Lack of processes capabilities / unable to achieve the objectives Lack of Data consistent during work Execution Assigned suppliers / subcontractors with undefined quality requirements Lack in understanding to the quality systems sequence and requirements Need Continuous training for different employees to understand the quality System Need Expertise / outsourcing people to develop the system Lack of Employees commitment to the work quality requirements	Lack of effective monitoring and measuring activities including quantifying the cost of poor quality & objectives' development	Ineffective to reduce amount & deviation Increase the operation cost

Table – 01 was used to develop the survey template. Thesurvey template was sent to 65 construction professionals have sufficient working experience in the construction industry more than 20 years (16 quality engineers and managers, 17 construction engineers and managers, 8 project managers, 10 project control engineers and managers, 8 commercial engineers and managers, 6lead auditors) for conducting semi structured interviews to give their perceptions for any additional barriers and rate the impacts of each barrier and the probability of causes' occurrence using rate scale (very low = 1, low = 2, Medium = 3, High = 4, very High= 5) . 30 of the selected construction professionals have accepted the interview's request (8 quality engineers and managers, 8 construction engineers and managers, 3 project managers, 6 project control engineers and managers, 3 commercial engineers and managers, 2 lead auditors). After consulting with them and discussing their barriers assessment, the (S x O) number was used to rank the barriers in descending order and was sent again to same respondents(30 construction professionals) for their final review, this result in preparing final ranking list for barriers (table 02) then Pareto chart was developed based on accumulative % of (S x O) number (Fig-01) with identification for the majorbarriers that account (60~80) % of the problem.

Table 02 - Ranking of Barriers		**(S)(O)**
1	Tight Project budget	25
2	Tight project schedule	23
3	Lack of top & middle management support & commitment to the Of demand for and utilization of the QPMS	22.50
4	Difficulty in applying QPMSF	21.50
5	Lack of required qualitative and quantitative data during QPMS planning	21.00
6	Insufficient time to collect the required information	20.50
7	Poor designed QPMS	20.00
8	Lack / Changes in assign the responsibilities , roles , work procedure and Objectives	19.50
9	Poor / Ineffective Communication	19.00
10	Turnover / lack of resource allocation	18.00
11	Misconception to the QPMS benefits / objectives	17.00
12	Ineffective to reduce amount (Cost) of waste & deviation	15.50
13	Increase the operation cost	15.50
14	Lack of Employees commitment to the work quality requirements	15.00
15	Lack of effective monitoring and measuring activities including quantifying the cost of poor quality & objectives' development	14.50
16	Need Continuous training for different employees to understand the quality System	14.00
17	Need Expertise / outsourcing people to develop the system	14.00
18	Need Huge amount and complex of paperwork	13.00
19	Lack of processes capabilities / unable to achieve the objectives	13.00
20	Lack of Data consistent during work Execution	13.00
21	Assigned suppliers / subcontractors with undefined quality requirements	13.00
22	Lack in understanding to the quality systems sequence and requirements	13.00

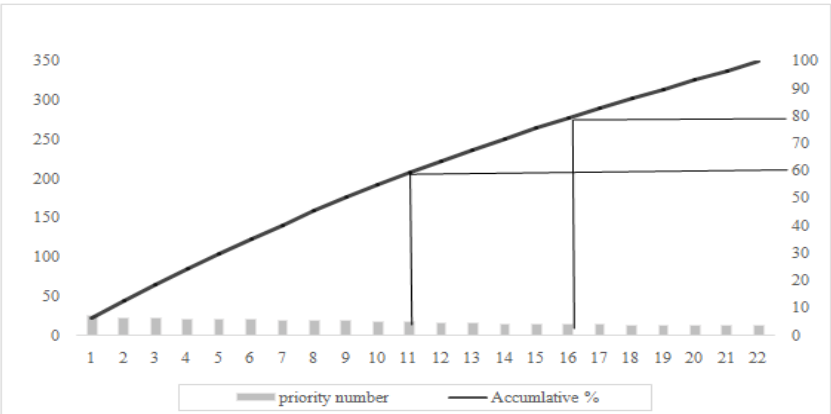

Fig 01 – Accumulative % of S x O number for barriers

Results discussion

From the compressive literature review, semi structure conducted interview as can be seen at table 01, the effective and efficiency implementation for the quality performance management system can be limited due to different barriers were found during project life cycle. In PLAN phase, the tight project's budget&schedule are lead to lack of (top&middle) management support and commitment to the of demand for and utilization of the QPMS. The lack of (top & middle)management support & commitment, this resulted in increasing the difficulty of applying QPMSF process due to unavailability ofthe sufficient time which is need to collect enough data to developQPMS operations structure (the operations objective, critical success factors / critical to quality, operation processes and mapping the interaction between them, standardized procedures with the inputs required and the expected outputs, quality measures, continuously monitoring and controlling processes) also there were found, the turnover and lack of resource allocation,this resulted in lacking /changing in responsibilities' assigning and poor communication lines. All above mentioned barriers will lead to develop a poor designed QPMS which is lead to different barriers in doing project phase and can be summarized as following (assigned suppliers / subcontractors with undefined quality requirements, lack in understanding to the quality systems sequence and requirements, complex &huge amount of paperwork, un-capabilities ' processes / unable to achieve the objectives, data inconsistent during work execution,and lack of employees commitment to work objective). All Do phase barriers are lead to continuous training and need to expert's people for developing the system during the work and lack of monitoring activities in (CHECK) phase . (Do and Check)barriers will be lead to increasein the cost of operationand poor role to QPMS in detecting the wastein (ACT) phase, thereforelack of people motivation towards improve the system and misconception towards the role and objective of QPMS will be existed.

As can be seen at table 02, (S x O) number was used to rank the barriers. The project tight budget is most major barrier has effect on the implementation of QPMS following by project tight schedule and the third one is the lack of (top & middle management) support & commitment to the of demand for and utilization of the QPMS .The top and middle management are used to focus more tomanage / control the performance using finical performance indicators and owner's acceptance for deliverables which can't represent / reflect the quality of the internal performancealso (table 02) showing that first 11 barriers where are located on project planning phase became in the first of the list while all the 7 barriers where are located in doing phase became in the last of the list.This ranking indicate that the people gave high priority to the planning phase's barriers rather than other phases.

As can be seen (fig-01) 60% increasing in the effective and efficiency of QPMS implementation can be achieved by controlling the first 11 barriers in the project'splanning phase (tight project budget, tight project schedule, lack of (top & middle management) support & commitment, difficulty in applying QPMSF, lack of required qualitative and quantitative data, insufficient time to collect the required information, poor designed quality system , lack / changes in assign the responsibilities, roles, work procedure and objectives, poor communication, turn over / lack of resource allocation, misconception to the QPMS benefits / objectives) while 80 % can be achieved as an improvement in the QPMS implementation by control plan, check, Act barriers in addition to control the need for continuous training for different employees to understand the quality System at Do phase.

Conclusion

Applying quality performance management system in managing the construction projects performance is increased the opportunity of meeting the business targets through improve the quality of operation performance which have indirect effect on achieving business goals. 22 barriers were identifiedwith their degree of effect on the sustainable implementation quality performance management system.The highest barrier is project tight budget while the lowest ones with same degree of effect are huge amount and complex of paperwork, lack of processes capabilities, and lack of data consistent during work execution, assigned suppliers / subcontractors with undefined quality requirements, lack in understanding to the quality systems sequence and requirements.

The ranking of barriers indicate that the people gave high priority to planning's barriers, then Act's barriers then check's barriersthen low priority was given to doing's barriers which indicate that the people in different project have enough experience to manage the barriers in doing phase but still the others barriers especially in the planning phase which are account 60% of the problem need more effort and support to can overcome it.Project team need to focus their effort on barriers at project plan phase to develop QPMS (effective/ fulfilling the quality requirements), (efficiency / able to improve the business results) and (relevant/ meeting employees' expectations) so the opportunity of successful applying to QMPS will be increased up to 60% and the people will be motivated more towards sustainable implementation and continuous improvement to quality performance management system which will be increased the opportunity of successful applying up to 80 %.

References:

[1.] Adedokun, O., Ogunsemi, D., Aje, I., Awodele, O. and Dairo, D. 2013 Apr. Evaluation of qualitative risk analysis techniques in selected large construction companies in Nigeria. J facilities Manag.11 (2): 123-135.
[2.] Callistus T, Clinton A. 2016 Dec. Evaluating barriers to effective implementation of project monitoring and evaluation in the Ghanaian construction industry. ProcediaSocBehav Sci.164: 389-394.
[3.] Changali S, Mohammad A, Nieuwland MV. 2015 Jul. The Construction Productivity Imperative (https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/the-construction-productivity-imperative).
[4.] Femi OT. 2015. Barriers and Benefits of total quality management in the Nigerian construction industry: A review. Int J Eng Works. 2 (1): 7-13.
[5.] Hoonakker P, Pascale Carayona P, Loushine T. 2010. Barriers and benefits of quality management in the construction industry: An empirical study. Total QualiManag Bus Excell J. 21(9): 953 –969.
[6.] Hristov I, Antonio Chirico A. 2016. The limits of the Balanced Scorecard. J Soci Sci. 4(11): 53-58.
[7.] Ingason HT. 2015 Jul. Best project management practices in the implementation of an ISO 9001 quality management system. ProcediaSocBehav Sci. 194: 192-200.
[8.] [ISO] International Organization for Standardization. 2015 Sept. ISO 9001/2015- Quality management systems Requirements.
[9.] Jamadagni S, Birajdar BV. 2015.Productivity improvement in construction industry. Int Res J Eng and Technol. 02 (8): 1330-1334.
[10.] Jelinkova L, Striteska M. 2015 Dec. Selected components affecting quality of performance management systems. ProcediaSocBehavSci .210: 181 – 187.
[11.] Juran JM, Defeo JA. 2016 October. Juran's Quality Handbook: The Complete Guide to Performance Excellence.7thedition. New York (NY). McGraw-Hill Education. Chapter 1, Universal Principles of Quality Management; P.15-31.
[12.] Keng TC 2010. A Study on top management commitment and ISO 9000 certification. Proceedings of the 3rd Regional Conference on Engineering Education & Research in Higher Education; June 7-9; kuching, Malaysia. School of Professional & Continuing Education.
[13.] Keng TC, Hamzah AR. 2011. Study of quality management in construction projects. Chinese Bus Rev.10 (7): 542-552.
[14.] Keng TC, Kamal SZ. 2016. Implementation of ISO quality management system in construction companies. J TechnolManag Bus. 03 (01): 1-23.
[15.] Lodgaard E, Ingvaldsena JA, Aschehouga S, Gamme I. 2016 Feb. Barriers to continuous improvement: perceptions of top managers, middle managers and workers. ProcediaSocBehav Sci.41: 1119 – 1124
[16.] Osmania F, Ramolli GM. 2012 Jun. Performance management, its Assessment and importance. ProcediaSocBehav Sci. 41: 434-441.
[17.] Polat G, Damci A, Tatar Y. 2011 Jun. Barriers and Benefits of total quality management in the construction industry: Evidence from Turkish contractors. 7th Research/Expert Conference with International Participations "QUALITY 2011